WAVE SCALING IN A TIDAL INLET MODEL

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INTRODUCTION

As part of the Corps of Engineers' Coastal Inlets Research Program, laboratory experiments were conducted to measure wave breaking on an ebb shoal for a typical dual-jettied tidal inlet. The objective was to provide information to parameterize breaking for numerical wave transformation models. The modeling test basin contained an inlet configuration that included ocean, inlet and bay regions (Figure 1). The inlet was idealized in shape, with simple contours for the adjacent beach, ebb shoal, and inlet channel. The inlet model could be considered approximately a 1:50 scale model, and this scale was assumed for determining model parameters defining wave height and period based on typical field values. The model wave heights ranged from 2 to 8 cm (which represented 1 to 4 m) and periods were 0.7 to 1.7 sec (which scaled 5- to 12-sec waves). Also, model ebb current speeds varied from 0 to 32 cm/sec. To confirm the use of Froude scaling, the experiments included a series of runs with 1.45 and 0.5 scaling factors (or 1:34 and 1:100 scales) of the original 1:50 scale. The full model bathymetry was not altered for the scale tests, but the model water level was adjusted to give the correct scaled depth on the shallowest portion of the ebb shoal, where the most intense

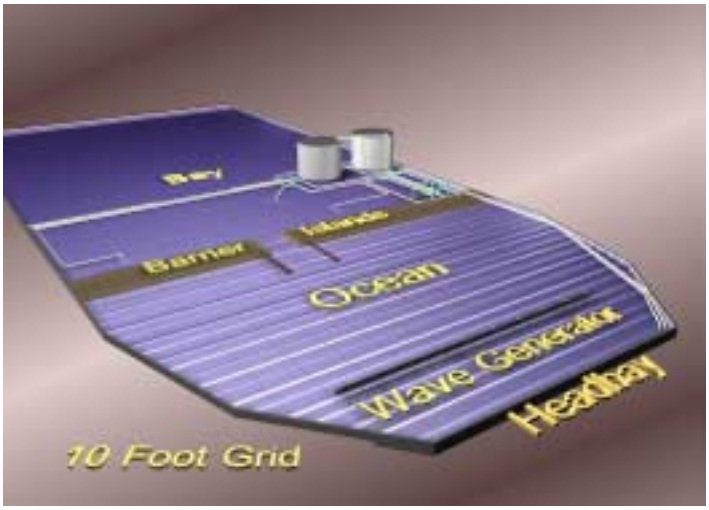

Figure 1. Coastal Inlet Laboratory Facility

breaking occurs.

The experimental setup included a wave generator located in 30-cm depth, parallel to the shoreline and perpendicular to the ebb current flowing from the inlet. A co-linear gauge array of six capacitance wave rods and five acoustic Doppler velocimeters, spaced 30 cm apart and alternating along their placement line, collected the measurement data. These instruments were mounted on a portable rack.

SELECTED RESULTS

Figure 2 shows the cross-shore bathymetry profile and wave gauge locations. Figure 3 shows results of the wave height variation for incident wave height of 5.5 cm, peak period of 0.7 sec, and current speed of 16 cm/sec. The 1:1.45 scaled wave heights are plotted in the same figure. The results indicate good agreement in the wave height across the ebb shoal (cross-shore distance 300-800 cm). The heights in the flat channel (cross-shore distance > 800 cm) show poorer agreement because the depth is not scaled and the current distribution in the channel varies somewhat between cases. The full paper will present a range of scale comparisons and discussion of the capability and limitations of physical models to scale wave-current interaction and breaking.

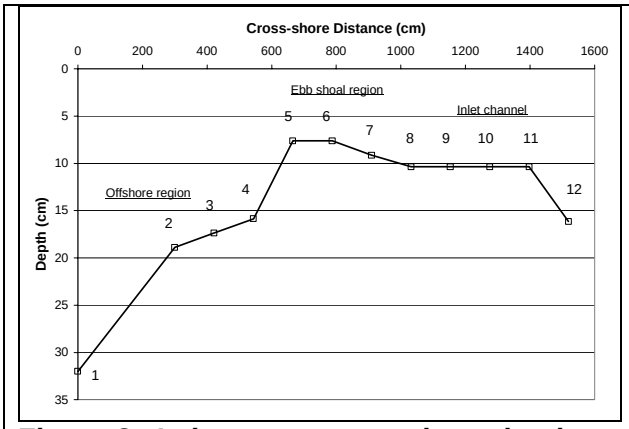

Figure 2. Laboratory cross-shore depth profile and gauge locations (1-12)

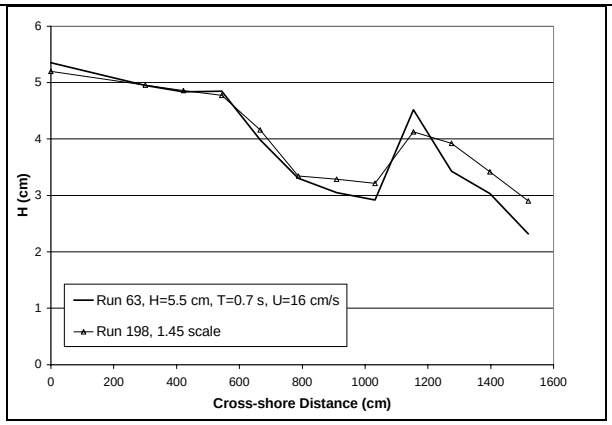

Figure 3. Wave heights for Runs 63 and 198

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